

Claims

What is claimed is:

1. A position sensor assembly adapted to mount externally to a linkage system, the position sensor assembly comprising:
  - a first sensor housing member adapted for external connection to the linkage system and having a first sensor conduit therein;
  - a second sensor housing member slidably received within the first sensor housing member and having a second sensor conduit therein;
  - a first sensor portion connected with the first sensor housing member; and
  - a second sensor portion connected with the second sensor housing member;wherein:
  - the first sensor housing member is configured and arranged to at least partially enclose the first sensor portion and the second sensor portion; and
  - the position sensor assembly is operable to register a position of the first sensor portion relative to the second sensor portion as a result of cooperation between the first and second sensor portions.
2. The position sensor assembly of claim 1, wherein:
  - the second sensor housing member is telescopically received within the first sensor housing member.
3. The position sensor assembly of claim 1, wherein:
  - the first and second sensor housing members comprise first and second tubes, respectively, the second tube being telescopically received within the first tube.

4. The position sensor assembly of claim 3, wherein the first and second tubes have generally circular cross-sectional shapes.

5. The position sensor assembly of claim 1, wherein:  
the first sensor portion is disposed generally parallel to or coaxially with the second sensor conduit and is configured and arranged to be movable within the second sensor conduit during operation of the position sensor assembly.

6. The position sensor assembly of claim 1, wherein the first sensor portion is arranged in a telescopically movable configuration relative to the second sensor portion.

7. The position sensor assembly of claim 1, further comprising a wiper element attached to the first sensor housing member.

8. The position sensor assembly of claim 1, further comprising:  
a module housing member connected to at least one of the first and second sensor housing members; and  
a sensor module operably connected to at least one of the first and second sensor portions and at least partially encased within the module housing member.

9. The position sensor assembly of claim 8, further comprising a connector operably connected to the sensor module and at least partially encased within the module housing member.

10. A linkage and sensor system comprising:  
a first linkage member;

a second linkage member movably connected to the first linkage member;

a position sensor assembly externally connected to the first and second linkage members, the position sensor assembly comprising:

a first sensor housing member externally connected with one of the first and second linkage members and having a first sensor conduit therein;

a second sensor housing member externally connected to the other of the first and second linkage members and slidably received within the first sensor housing member, the second sensor housing member having a second sensor conduit therein;

a first sensor portion connected with the first sensor housing member; and

a second sensor portion connected with the second sensor housing member;

wherein:

the first sensor housing member is configured and arranged to at least partially enclose the first sensor portion and the second sensor portion; and

the position sensor assembly is operative to register a position of the first linkage member relative to the second linkage member as a result of cooperation between the first and second sensor portions.

11. The linkage and sensor system of claim 10, wherein:

the second sensor housing member is telescopically received within the first sensor housing member.

12. The linkage and sensor system of claim 10, wherein:

the first and second sensor housing members comprise first and second tubes, respectively, the second tube being telescopically received within the first tube.

13. The linkage and sensor system of claim 12, wherein the first and second tubes have generally circular cross-sectional shapes.

14. The linkage and sensor system of claim 10, wherein:  
the first sensor portion is disposed generally parallel to or coaxially with the second sensor conduit and is configured and arranged to be movable within the second sensor conduit during operation of the linkage and sensor system.

15. The linkage and sensor system of claim 14, further comprising a sensor guide member attached to the first sensor portion between the first sensor portion and the second sensor housing member, the sensor guide member being operative to limit or at least inhibit contact between the first sensor portion and the second sensor housing member.

16. The linkage and sensor system of claim 10, wherein the first sensor portion is arranged in a telescopically movable configuration relative to the second sensor portion.

17. The linkage and sensor system of claim 10, further comprising a wiper element attached to the first sensor housing member.

18. A linkage and sensor system comprising:  
a first linkage member;  
a second linkage member movably connected to the first linkage member; and  
a self-aligning position sensor assembly connected with the first and second linkage members, the position sensor assembly comprising a first sensor portion operatively connected to the first linkage member;

a second sensor portion operatively connected to the second linkage member;

a sensor housing member at least partially enclosing at least one of the first and second sensor portions; and

at least one self-aligning mounting member connecting the sensor housing member externally to the first linkage member;

wherein:

the at least one self-aligning mounting member is operable to align the sensor housing member in a predetermined orientation relative to the first linkage member during assembly of the sensor housing member with the first linkage member; and

the position sensor assembly is operative to register a position of the first linkage member relative to the second linkage member as a result of cooperation between the first and second sensor portions.

19. The linkage and sensor system of claim 18, wherein the at least one self-aligning mounting member has a contoured mounting surface configured for alignment with an external portion of the first linkage member.

20. The linkage and sensor system of claim 18, wherein the at least one self-aligning mounting member is operable to align the sensor housing member in a generally parallel and spaced apart relationship relative to the first linkage member.

21. The linkage and sensor system of claim 18, further comprising a sensor member operably connected between the second sensor portion and the second linkage member and telescopically received within the sensor housing member.

22. The linkage and sensor system of claim 18, wherein:

the first linkage member has a cylindrical portion; and  
the contoured mounting surface of the at least one self-aligning  
mounting member has a curved portion that generally conforms to the outer  
surface of the cylindrical portion.

23. The linkage and sensor system of claim 18, wherein the  
position sensor assembly comprises at least two spaced apart self-aligning  
mounting members.

24. A method of determining the position of a first linkage  
member relative to a second linkage member, the method comprising:  
adapting the first linkage member with a first sensor portion at  
least partially enclosed by a first sensor housing member, wherein the first sensor  
portion and the first sensor housing member are externally disposed relative to  
the first and second linkage members;

adapting the second linkage member with a second sensor portion  
that is connected to a second sensor housing member and that is at least partially  
enclosed by the first sensor housing member, wherein the second sensor portion  
and the second sensor housing member are externally disposed relative to the first  
and second linkage members;

moving the first linkage member relative to the second linkage  
member;

causing the first sensor housing member to enclosingly and  
slidably receive the second sensor housing member, wherein the first sensor  
portion is in a telescopically movable relationship relative to the second sensor  
portion; and

causing the position sensor assembly to register a position of the  
first linkage member relative to the second linkage member as a result of  
cooperation between the first and second sensor portions.